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VIRTUAL REALITY - AN INNOVATIVE APPROACH TOWARDS EDUCATION

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ABSTRACT

The usage of Head Mounted Displays (HMD) to observe Virtual Reality (VR) settings has grown in recent years, thanks to the advent of high-quality, low-cost devices that give a satisfying user experience. Virtual reality and simulation enable for hands-on learning in specially tailored environments. Simulated experiences are understood by apprehension, which entails actual participation in the experience, or understanding, which necessitates abstract cognition. Internalized reflection of an experience or expansion through active experimentation are then used to modify the experiences. Both intention and extension result in the learner gaining information. Furthermore, data suggests that freely wandering about an immersive environment activates brain activity by increasing cognitive encoding in working memory, which leads to better cognitive retrieval success. For construction management students, traditional hands-on learning, site visits, and practical job experience are seen as very powerful experiential learning tools. Limited resources, such as hands-on learning space, material costs, and site visit time, all limit the scope of these activities in undergraduate construction education. Additionally, there is a growing demand for experiential learning activities for distance learning students who are unable to participate in in-person experiences due to their geographic location. Immersive VR is being investigated as a possible solution to address these limits and provide more participatory and experiential learning. One of the most significant disadvantages of virtual reality as a learning aid is the lack of theories or models on which to base and justify its use. This paper defends the metaphorical design of educational virtual reality systems. The goal is to develop virtual environments that can store and transmit information.

KEYWORDS: Virtual Reality, Head Mounted Display, New Technology, VR Education.

INTRODUCTION TO VIRTUAL REALITY:

Virtual reality is a cutting-edge technology that has emerged in the contemporary digital era. Technology is fast evolving in many areas today, particularly in the field of information technology and communication. In the previous two decades, India has made significant progress in the fields of information technology and communication (ITC). With the advancement of information and communication technology, many industries have altered and improved. In the educational industry, information technology is one of the most important tools for advancing the learning process. Education is a vital instrument for cultivating students' knowledge and abilities to prepare them for life, employment, and citizenship through pedagogy.

Link between Education and Information Technology:

Especially in E-Learning India rapidly evolved through the National programme on technology-enhanced learning is an MHRD programme spearheaded by seven Indian technical institutes (Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati, and Roorkee).

The virtual reality environment will be used as a tool for a new educational method. Its goal is to assess the use of virtual reality technology in education as a tool for providing new teaching methodologies.

What is Virtual Reality?

Initially, Jaron Lanier, the creator of VPL Research, created the term Virtual Reality (VR) in 1989(Conn et al., 1989). Virtual reality (VR) is defined as "an experience in which a person is surrounded by a three-dimensional computer-generated representation and may walk around in it and observe it from different angles, can reach into it, grab it, and modify it" by Howard Rheingold (ELLIS, 1993) in 1991.

> *"A computer-generated reality including one or more human senses and created in real-time by the participant's actions,"*and later defined as VR. (Bertol, 1996)

Virtual Reality is 3D-generated content developed for VR to allow the user to experience their own feel like the real world for that it is simulating the real world content or replicating the real-world elements and it is based on the Stereoscopic Projection. (DeVito & Ngalamou, 2021) To perceive the depth details of an image, the brain captures the projection details projected by monocular and binocular projection. These projections as considered as a stereoscopic projection which is used to increase the 3D depth in the scene of the image in 3 dimensions.

There are two types of immersion felt by the user one is non-immersive another one is fully immersive this based on the virtual reality devices. The immersion is based on devices generally the VR devices it has different types of devices like Cave Automatic Virtual Environment (CAVE) and Head Mounted Devices (HMDs). So, the technology is used to enhance the growth of virtual reality content.

In VR there are two different types of displays is used in the current technology one in CAVE and another one in HMDs as mentioned earlier. VR Display systems are CAVE and HMDs. CAVE has developed Thomas de Fanti's University of Illinois (DeFanti et al., 2011). CAVE display is one of the not well known to the people because its commercially very high-priced device. So, the people can't afford this device generally this should be the lag and unawareness of this device and also its very difficult to set up this display. The Cave refer to Cave automatic virtual environment. The setup is based on a minimum of four displays placed on the wall and its surrounded by the user so the user can interact with the display. HMDs derived head-mounted display the device can wear by the user surrounded the head part.

HISTORY:

The Kinetograph and Kinetoscope were invented by Thomas Edison and his collaborator William Dickson in the 1890s. which was used by Auguste and Louis Lumière in the year 1895 later Edwin Link in the year 1929 developed a link trainer also called pilot maker which is the pioneer of flight simulation. In 1956 Cinematographer Morton Heilig developed the device that produce artificial sensory experiences which later was developed as a 3D Head Mounted Display in the year 1957 and in 1962, he was granted a patent for upgrading kinetoscope sensorama a highly sophisticated Kinetoscope. Ivan Sutherland created the light pen hardware and sketchpad software in the same year, allowing individuals to draw on a computer screen. In 1965, Ivan Sutherland created the ultimate display, a sophisticated HMD that was later modified to include Stereo 3D vision in 1968. Will Crowther, a programmer, created a hugely significant text-based computer game in 1975 in which players explore a virtual world, emphasising the video place, a pioneering VR experience.

Virtual Reality in Education:

(Qin & Gao, 2021) have stated virtual reality application has attracted worldwide attraction education industry. The Japanese education industry has begun to combine the virtual technology application to promote the education industry to the next level to the future. (Bashabsheh et al., 2019) have reported that virtual reality technology has a huge improvement in architectural education methodologies, strategies, and tools. The focus is to improve the new education approaches using virtual reality applications. Pedagogy, according to Mortimer (1999), is "any purposeful activity by a person to assist the learning of another."

Virtual Reality Application for Higher Education:

(Radianti et al., 2020) observed the immersive application of VR in higher education from both high-end and HMD devices. In terms of learning aspects, VR design features, and learning theories, the study focuses on three major elements of the existing domain structure. So, the application mapping with VR design elements and learning contents. VR immersion is considered with a degree. There

are two types of HMD's available in the market. One is a three-degree of freedom HMD and another one is Six Degree of freedom HMD. This differs difference between the three and six degrees. Six degrees gives more immersion level compared to three-degree HMD's. Generally, a Mobile VR headset comes with three-degree HMD's and Six Degree mostly dedicated virtual reality companies' products like Oculus, HTC Vive, and so on.

Pedagogical evacuation of a building and behavioural influences, gaming environment development and outcome, and participant experience metrics are the focus of (Feng et al., 2018). (Wang et al., 2018)Virtual reality and VR-related technologies, as well as their uses, implementation areas, and future prospects in construction engineering education and training. (Chavez & Bayona, 2018) The properties of virtual reality, teaching subjects, and the effects of incorporating virtual reality into the learning process. Merchant and his colleagues (2014) Games, simulations, or virtual worlds that use desktop-based virtual reality technologies as an assessment, diagnostic, or therapeutic tool.

Virtual Reality Technology in Architectural Pedagogy:
(Bashabsheh et al., 2019) observed integration the new VR with the traditional 3D architectural pedagogy, as the VR technology is integrated with 3D tools using the 4D CAD plans to review the 4D construction plans. The methodology follows the seven steps including VR software designing, questionnaire, students samples, and collecting the data from the student's answer finally it has analysing and discussing the results. The process starts with 2D planning next to its process in the 3D software to develop the plan and implement the 2D plan finally VR application is prepared to access the VR HMD. The study adopted the fifth Likert scale for determining the values of the samples and data. The conclusion of the study focused the Virtual Reality how it transfers from the traditional teacher-centred teaching methodology to Student-centred methodology.

Design and Construction Education and Training in VR:
Virtual reality and simulation have been utilised in design and construction to help students boost their awareness and knowledge of several issues. When time, inaccessibility of the actual event, safety owing to dangerous situations, and ethical considerations are impediments to physical participation in the event, immersive VR has been studied through several education areas.

(Fogarty et al., 2018) employed both CAVE-type VR and HMD-VR in an immersive environment to help students learn about structural components and assemblies in static models and more advanced design concepts like load limit and buckling in dynamic models. Students reported having a better understanding and capacity to visualise these concepts as a result of the interactive nature of the environment. (Luo & Chhabda, 2018) built an online virtual lab for structural design and analysis that allowed students to customise structural beam designs and see a virtual "lab test" to show how the design behaved to various load circumstances.

(Messner et al., 2003) designed a method for students to analyse 4D simulations they created in a CAVE environment in order to better understand construction management processes They claimed that, in comparison to 2D representations of the model, students were able to better criticise the models they and others created in the full-scale virtual world. (Pariafsai, 2016) created an interactive game that focuses on the processes of construction management. When students were able to view risk-free outcomes to decisions that might otherwise have unfavourable real-world consequences, they performed better in problem solving and critical thinking.

When using a model that can be easily dismantled within a virtual environment, (Sampaio et al., 2010) discovered an impact on student knowledge of building methods and assembly in relation to bridge models in civil engineering education. Another area where 3D simulation and virtual reality have been investigated is construction safety. investigated the use of head-mounted displays (HMDs) to analyse human behaviour in a variety of dangerous work scenarios that are commonly encountered when training new employees. This allowed the participants to experience dangerous job situations without putting themselves in danger. (Le et al., 2015) used virtual content to integrate safety information into a building materials classroom using mobile-based virtual simulations. Students were given materials to supplement a typical lecture, as well as a hazard identification game module that allowed them to practise danger awareness and reaction in a virtual setting. Preliminary studies and prototype development shown that there are advantages to the On a fast-paced jobsite, students must learn the importance of safety.

(Paes et al., 2017) When architectural students were asked to compare their understanding of spatial perception between a non-immersive VR system on a workstation and a stereoscopic panoramic projection, they discovered that the wider display provided a more favourable sense of space within the architectural model. These results are similar to those of a case study in which CAVE-like VR projection systems were utilised for client and user design review in healthcare design, with future occupants benefiting from a better understanding of spatial situations.

The use of HMD-VR solutions in construction instruction is extremely limited. The necessity to generate relevant, readily available, and usable information is most likely due to the newness of affordable technology.

Virtual Reality Application in Mathematics and Geometry:
(Kaufmann et al., 2000) Virtual reality applications in mathematics and geometry education at the high school and university levels. The study is based on construct 3D is a 3D tool for geometry and also it been the pilot study using construct 3D tool using experimental with geometry constructions. The method is following two steps first one is the participants should solve the mathematical problems using construct 3D with help of a tutorial. The second step is the survey-based question about VR and construct 3D.

Virtual Reality in Health care and Clinical Diagnosis:
It is well recognised that e-learning is the most up-to-date way of education at the moment, particularly when a student is unable to attend college or school and complete his homework, such as during the Corona epidemic (Covid-19), through lectures and electronic lessons in the form of video (Ibrahim & Abd-Alhassan, 2021). Electronic platforms where learning can occur at any time and in any location, and which contain modern learning tools through which virtual reality can be applied in education, particularly medical education, and which contain three-dimensional models (3D) that are closer to the truth due to the interactive content they contain. This system was designed on the basis of the (ADDIE) paradigm and the usage of the following technologies in the system (ASP.NET, CSS, Java script, Html), (SQL-server) for database, and (web Gel, bootstrap, and JQuery) for virtual reality (Kaufmann et al., 2000). In medical education, virtual reality is being used to teach empathy. The project used virtual reality (VR) software to train medical and other health professions students to be empathic with older persons and to familiarise medical students with information resources pertaining to the health of older adults (Dyer et al., 2018).

Virtual Reality as a Tool for Patient Education. Virtual reality (VR) is a type of immersive visual watching that has lately gained popularity in clinical care. To evaluate the utility of virtual reality (VR) in patient education, we created a three-dimensional (3D) model of an abdominal aortic aneurysm (AAA) for patients with a AAA diagnosis to observe in VR (Pandrangi et al., 2019).

Virtual Reality Environment for Pupil Elementary Schools During Covid 19:
(Cardona-Reyes, Muñoz-Arteaga, et al., 2021) Our day-to-day lifestyle has changed due to the pandemic outbreak of Covid-19, which limits physical contact and public gathering. During this situation, technology evolved in a different phase, where virtual reality is the bridge of the essential communication and solutions to overcome the Covid outbreak. Virtual reality is very effective in the stream of learning, training, and knowledge transmission through executing tasks established by multi-disciplinary groups through this sensory experience. It improves learning skills through friendly and enjoyable engagement, as well as in a healthy manner. This is a different type of specialised support for children with exceptional educational needs such as attention deficit hyperactivity disorder (ADHD) and other related conditions. The lean UX process model is used to create reality environments and information that adhere to the expert therapeutic benchmark. A case study demonstrates how the user experience is evaluated using an interactive environment to support elementary school children with specific educational needs who attend a Mexican educational institution.

CONCLUSION:
The educational potential of virtual reality is garnering the attention of an increasing number of academics and organisations. In terms of improving students' learning experiences, virtual reality (VR) has had mixed results, and it is clear that learning tools must be carefully designed and implemented in order to provide an authentic, engaging learning experience for students and thus drive their engagement, enjoyment, and interest in a subject. Virtual reality has been utilised alongside a range of other traditional instruments and experiences in many studies, which may have influenced the results. There is greater opportunity in the literature for studies that explicitly compare conventional tools to VR tools, as well as VR tools plus conventional tools. Finally, there are still significant scalability challenges for technology to meet the ever-increasing populations of educational institutions, even though these concerns are not insurmountable given technological advancements and innovation.

BIBLIOGRAPHY:

I. Bashabsheh, A. K., Alzoubi, H. H., & Ali, M. Z. (2019). The application of virtual reality technology in architectural pedagogy for building constructions. Alexandria Engineering Journal, 58(2), 713–723. https://doi.org/10.1016/j.aej.2019.06.002

II. Bertol, D. (1996). Designing digital space: an architect's guide to virtual reality. John Wiley \& Sons.

III. Cardona-Reyes, H., Muñoz-Arteaga, J., Villalba-Condori, K., & Barba-González, M. L. (2021). A lean ux process model for virtual reality environments considering adhd in pupils at elementary school in covid-19 contingency. Sensors, 21(11). https://doi.org/10.3390/s21113787

IV. Cardona-Reyes, H., Ortiz-Aguiñaga, G., Barba-Gonzalez, M. L., & Muñoz-Arteaga, J. (2021). User-Centered Virtual Reality Environments to Support the Educational Needs of Children With ADHD in the COVID-19 Pandemic. IEEE Revista Iberoamericana de Tecnologias Del Aprendizaje, 16(4), 400–409.

V. Chavez, B., & Bayona, S. (2018). Virtual reality in the learning process. World

Conference on Information Systems and Technologies, 1345–1356.

VI. Conn, C., Lanier, J., Minsky, M., Fisher, S., & Druin, A. (1989). Virtual environments and interactivity: Windows to the future. ACM SIGGRAPH 89 Panel Proceedings, 7–18.

VII. DeFanti, T., Acevedo, D., Ainsworth, R., Brown, M., Cutchin, S., Dawe, G., Doerr, K.-U., Johnson, A., Knox, C., Kooima, R., & others. (2011). The future of the CAVE. Open Engineering, 1(1), 16–37.

VIII. DeVito, N., & Ngalamou, L. (2021). VR Implementation in User-Interactive Simulation Environments. 2021 IEEE 7th International Conference on Virtual Reality (ICVR), 172–179.

IX. Dyer, E., Swartzlander, B. J., & Gugliucci, M. R. (2018). Using virtual reality in medical education to teach empathy. Journal of the Medical Library Association: JMLA, 106(4), 498.

X. ELLIS, S. R. (1993). A review of:"Virtual Reality", by HOWARD RHEINGOLD, Summit Books/Simon and Schuster, New York (1991), pp. 415, $22•95, isbn 0-671-69363-8. Ergonomics, 36(6), 743–744.

XI. Feng, Z., González, V. A., Amor, R., Lovreglio, R., & Cabrera-Guerrero, G. (2018). Immersive virtual reality serious games for evacuation training and research: A systematic literature review. Computers \& Education, 127, 252–266.

XII. Fogarty, J., McCormick, J., & El-Tawil, S. (2018). Improving student understanding of complex spatial arrangements with virtual reality. Journal of Professional Issues in Engineering Education and Practice, 144(2), 4017013.

XIII. Ibrahim, A.-W. S., & Abd-Alhassan, A. A. (2021). Applied Virtual Reality (Vr) In Education Medicine. Design Engineering, 9882–9897.

XIV. Kaufmann, H., Schmalstieg, D., & Wagner, M. (2000). Construct3D: A virtual reality application for mathematics and geometry education. Education and Information Technologies, 5(4), 263–276. https://doi.org/10.1023/A:1012049406877

XV. Le, Q. T., Pedro, A., Lim, C. R., Park, H. T., Park, C. S., & Kim, H. K. (2015). A framework for using mobile based virtual reality and augmented reality for experiential construction safety education. International Journal of Engineering Education, 31(3), 713–725.

XVI. Luo, Y., & Chhabda, J. S. (2018). Design and implementation of a virtual lab in an engineering laboratory course. Proc. The 54th Annual ASC International Conference, April, 18–21.

XVII. Messner, J., Yerrapathruni, S., Baratta, A., & Whisker, V. (2003). Using virtual reality to improve construction engineering education. 2003 Annual Conference, 8–1266.

XVIII. Paes, D., Arantes, E., & Irizarry, J. (2017). Immersive environment for improving the understanding of architectural 3D models: Comparing user spatial perception between immersive and traditional virtual reality systems. Automation in Construction, 84, 292–303.

XIX. Pandrangi, V. C., Gaston, B., Appelbaum, N. P., Albuquerque Jr, F. C., Levy, M. M., & Larson, R. A. (2019). The application of virtual reality in patient education. Annals of Vascular Surgery, 59, 184–189.

XX. Pariafsai, F. (2016). Effectiveness of a virtual project-based simulation game in construction education. International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), 2(5), 377–393.

XXI. Qin, G., & Gao, L. (2021). Application of VR Technology in Japanese Education. The International Conference on Cyber Security Intelligence and Analytics, 217–224.

XXII. Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. Computers and Education, 147(December 2019), 103778. https://doi.org/10.1016/j.compedu.2019.103778

XXIII. Sampaio, A. Z., Ferreira, M. M., Rosário, D. P., & Martins, O. P. (2010). 3D and VR models in Civil Engineering education: Construction, rehabilitation and maintenance. Automation in Construction, 19(7), 819–828.

XXIV. Wang, P., Wu, P., Wang, J., Chi, H.-L., & Wang, X. (2018). A critical review of the use of virtual reality in construction engineering education and training. International Journal of Environmental Research and Public Health, 15(6), 1204.